Tangled Paths: a new random graph model from Mallows permutations.

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We introduce a new random graph model, the tangled path, which results from taking the union of two paths where the vertices of one have been relabeled according to a (non-uniform) random permutation sampled from the Mallows distribution with real parameter $0 < q(n) < 1$. Increasing the parameter q in the Mallows distribution has the effect of increasing the number of inverted pairs of elements in the permutation. This has the following effect on the resulting graph: if q is close to 0 the tangled path bears resemblance to a path (if $q < 1$ is fixed then the diameter is linear) and as q tends to 1 it becomes an expander.

In order to further understand the effect of the parameter q on the structure we obtain bounds on the treewidth in terms of q. We also give a sharp threshold for the property of having a balanced separator of size one.

This talk is based on joint work with Jessica Enright, Kitty Meeks and William Pettersson.